REMARKS

Claims 16-17, 19-35, 37-43, 48 and 51-52 are currently pending in the present application of which claims 21-22 and 26-30 have been withdrawn pursuant to 35 USC 121. Accordingly, claims 16-17, 19-20, 23-25, 31-35, 37-43, 48 and 51-52 are under consideration.

Independent claims 16 and 34 have been amended to more distinctly claim the invention. In particular, claim 16 has been amended to present the claim in better idiomatic English and also to recite that the grown nitride alloy film is thicker than the spin coated layer and that the grown nitride alloy film has a different group III element than the spin coated film. Adequate written descriptive support for the amended claim can be found throughout the detailed specification. For example, on page 5, beginning at line 21, Applicant describes an embodiment which includes growing a nitride film on an aluminum nitride buffer. Applicant's third embodiment and Fig 5 also support these amendments. The remaining claims have been amended to be consistent with the independent claims and to recite better idiomatic English. Claim 25 has also been amended to recite that the growth methods are different as provided in the specification on page 9, beginning on line 14; and claim 33 has been amended to depend on active claim 31. Accordingly, it is respectfully submitted that no new matter has been added to the application.

Claim Objection

Claim 33 was objected to because it depended on a non-elected claim. Applicant has amended claim 33 to depend on active claim 31. Accordingly, reconsideration and withdrawal of the rejection are respectfully solicited.

Rejection Under 35 USC 102

Claims 16, 17 and 19 were rejected under 35 USC 102(b) as being anticipated by either Puchinger or Aldinger. The rejection is traversed and it is respectfully submitted that claims 16, 17 and 19 currently pending in the application are patentable within the meaning of 35 USC 102(b).

Claim 16 is directed to a method of grown an epitaxial III-V nitride alloy. The claim has been amended to recite that the spin coated layer contains a different group III element than the grown group III-V nitride alloy. Claims 17 and 19 further define aspects of the method of independent claim 16.

In contrast, both Puchinger and Aldinger teach the opposite of this method. In particular, these references teach the sequential formation of gallium nitride layers (i.e., the sequential formation of layers containing the same group III element). (See, e.g., Aldinger, column 3, lines 33-36.) Accordingly, for at least this reason, Puchinger and Aldinger do not anticipate the now claimed subject matter. Reconsideration and withdrawal of the rejection are respectfully solicited.

Rejection Under 35 USC 103

Claims 16-17, 19-20, 23-25, and 31-33 were rejected as obvious under 35 USC 103(a) over various combinations of Hanaoka, Nishio, Furushima, Furukawa, Puchinger and Aldinger and Iacopini. The rejection are traversed and it is respectfully submitted that these claims as well as claim 52 are patentable within the meaning of 35 USC 103(a).

As discussed above, independent claim 16 is directed to a method of growing an epitaxial III-V nitrides alloy. The method comprises spreading a liquid comprising one or more group III elements and nitrogen on a substrate; spin coating the substrate with the liquid; annealing the spin coating layer to form a crystalline layer thereof; and growing an III-V nitride alloy film on the spin coated annealed layer. The claim requires that the grown III-V nitride alloy film is different from the one or more group III elements of the spin coated film. Dependent claim 17, 19-20, 23-25, 31-33, and 52 further define aspects of independent claim 16.

In contrast, none of the cited references teach or suggest, individually or combined, growing an epitaxial nitrides alloy comprising group III-V elements by spin coating a liquid onto a substrate having one or more group III elements and nitrogen, annealing the spin coated layer, and growing a III-V nitride alloy film on the spin coated layer provided that the group III element in the spin-coated layer is different from the Group III element in the grown nitride alloy layer. It is further noted, that none of the cited references teach or disclose growing the epitaxial III-V nitride alloy film by a sequential combination of two or more growth methods as recited in dependent claim 25.

In particular, Hanaoka relates to forming a non-single crystalline gallium nitride layer over a Group III-V nitride layer. Hanaoka specifically teaches that to form the non-single crystalline layer, an MOCVD process is employed in which the substrate temperature is maintained at a lower temperature than normal. (See column 3, lines 53-64.)

Nishio relates to preparing semiconductor light emitting devices. Nishio discloses some of the problems that Applicant has noted in the specification. In particular, Nishio discloses that lattice mismatch between layers is an important factor in the growth of III-V

nitride alloys. Nishio also discloses that making nitride layers on wafers of larger sizes is difficult. (See, column 1, line 30 and lines 54-56.) Nishio's entire disclosure is directed to forming gallium nitride-base materials on silicon carbide. The difficulties that Nishio tries to overcome is achieved by providing a buffer layer on the silicon carbide layer prior to forming a gallium nitride based material thereon. Nishio does not suggest using its techniques on a sapphire substrate. To the contrary, Nishio teaches away from this aspect. In this regard, Applicant respectfully disagrees with the Examiner's assertion that one of ordinary skill in the art would have combined the teachings of Puchinger and Aldinger.

Furukawa relates to improving the activation yield of a p-type gallium arsenide layer. Furukawa does not teach or suggest a method of growing an epitaxial Group III-V nitride alloy by spreading a liquid comprising a Group III element and nitrogen and growing a Group III-V nitride alloy thereon wherein the grown Group III-V nitride alloy film is different from the Group III element of the spin coated film.

Accordingly, since none of the cited references suggest the combined steps of spin coating a layer followed by growing a III-V nitride layer thereon, when the spin coated layer has a different group III element that the grown layer, the references can not negate the patentability of the claimed subject matter. Moreover, there must be some motivation to make the changes asserted by the Examiner to arrive at the claims without relying on Applicant's disclosure. In this regard, the Examiner asserts economic advantage as the driving force behind the asserted modifications. Applicant respectfully stresses, however, that there are other factors that weigh more heavily than economics, as discussed below. The fact is that growing III-V nitride films is difficult as evidenced by the cited art relating to the growth of such films. These difficulties can not simply be ignored.

Claims 34-35, 37-43, 48 and 51 were rejected under 35 USC 103(c) as obvious over Furushima in view of Ito and/or Hoffman and/or Hanaoka. The rejections are traversed and it is respectfully submitted that these claims are patentable within the meaning of 35 USC 103(a).

Independent claim 34 is directed to a method of growing an epitaxial Group III-V nitride alloy. The method comprises spreading a liquid comprising a compound having a metal and oxygen on a substrate, spin coating the liquid, annealing the liquid and then growing a III-V nitride alloy film on the spin coated annealed film.

Furushima teaches the formation of light emitting diodes. Furushima teaches the problems associated with forming crystalline gallium arsenide and on a silicon carbide substrate. In particular, Furushima recognizes that there are lattice mismatches and dislocations on the surface of a substrate which lead to poor crystalline growth of a gallium arsenide overlayer. (See, e.g., background of Furushima). Furushima then teaches a solution to these problems, which is, vapor depositing a zinc oxide buffer layer between the substrate and gallium arsenide layer. Furushima teaches that it is preferable to have a thin <u>single</u> crystal layer or alternatively a zinc oxide buffer layer having <u>some polycrystals</u> provided that the etch pit density caused by crystal defects are low. (See Furukama, column 2, lines 10-22.)

In contrast, Ito, the secondary reference, has nothing to do with forming light emitting diodes. Consequently, Ito has nothing to do with the problems associated with forming crystalline gallium arsenide layers. Ito, instead, relates to forming zinc oxide varistors. The problems associated with forming a varistor are different and significant than that of growing gallium arsenide crystals. Indeed, Ito discloses that the size of its crystals in its zinc oxide

layer should be of particular size. Ito does not recognize that a polycrystalline zinc oxide layer would not be suitable for growing a gallium arsenide layer. This is not surprising, however, since Ito has nothing to do with the problems addressed in forming a gallium arsenide layer.

In the Office Action, it was asserted that one of ordinary skill in the art would modify the vapor phase growth taught in Furushima with Ito's method of forming a crystalline film using a solution technique be cause solution routes to single crystal thin films are economically advantageous. Applicant respectfully disagrees with this assertion and its conclusion. Initially, it should be stressed that Ito does <u>not</u> teach forming a <u>single crystalline zinc oxide</u>. Ito relates to forming a zinc oxide layer having crystal sizes of an average particle diameter less than 10 microns and more preferably less than about 300 nanometers. (See Ito, column 2, lines 38-42.) The Examiner's reasoning that one of ordinary skill in the art would be motivated to substitute the method of Ito in place of Furushima because of economic advantages is misplaced.

Furushima would not be teaching an allegedly more difficult and expensive route of growing a zinc oxide film through vapor phase deposition if it could achieve the same results in a less expensive manner. Applicant respectfully submits that the Examiner is minimizing the difficulties in preparing epitaxial gallium arsenide film. They are no so easily formed. The vast majority of the references that have been cited in this Office Action support this contention. It is difficult to form group III-V nitride alloys. The majority of these references note and recognize the difficulty in growing crystals of these materials and have all sought different solutions for these various problems. Accordingly, there is no basis in the record to believe that the substitution asserted by the Examiner would be expected to be successful by

one of ordinary skill in the art. To the contrary, the evidence in the record suggests otherwise.

Based upon the foregoing, it is respectfully submitted that claims 16-17, 19-20, 23-25, 31-35, 37-43, 48 and 51-52 are patentable within the meaning of 35 USC 102 and 103. Favorable consideration and allowance of the application are requested.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

MCDERMOTT, WILL & EMERY

Daniel Bucca, Ph.D.
Registration No. 42,368

600 13th Street, N.W.
Washington, DC 20005-3096
(202) 756-8000 DB:MWE
Facsimile: (202) 756-8087
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